

September 29, 1998

FOR: The Commissioners

FROM: L. Joseph Callan /s/  
Executive Director for Operations

SUBJECT: ISSUANCE OF A SECTION 274f, ATOMIC ENERGY ACT ORDER TO EXEMPT ENVIROCARE OF UTAH, INC. FROM THE LICENSING REQUIREMENTS FOR SPECIAL NUCLEAR MATERIAL IN DIFFUSE WASTE THAT WILL BE REGULATED BY THE STATE OF UTAH

## PURPOSE:

To seek, by negative consent, the Commission's approval of the staff's plans to issue an order to Envirocare of Utah, Inc., (Envirocare), under Section 274(f) of the Atomic Energy Act (AEA), to exempt Envirocare from the licensing requirements for storage and disposal of special nuclear material (SNM) in diffuse waste that will be regulated by the State of Utah.

## BACKGROUND:

In 1992, Envirocare filed a petition for rulemaking with the U.S. Nuclear Regulatory Commission (NRC) to exempt SNM in diffuse waste from the possession limits in [10 CFR Part 150](#). Envirocare further requested expedited rulemaking and/or an exemption from the licensing requirements in [10 CFR Part 70](#) in letters dated July 15 and August 11, 1997. Staff's review of the petition request and discussion of other SNM related issues were presented in SECY 98-010, "Petition for Envirocare of Utah to Possess Special Nuclear Material in Excess of Current Regulatory Limits," dated January 20, 1998.

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Envirocare submitted a license application on December 5, 1997. However, because of insufficient descriptions of the requested activities and lack of supporting technical data, staff found the application unacceptable and rejected the application, in a letter to Envirocare dated March 4, 1998. Staff's predominant concern was related to criticality safety of the mixed-waste processing. Since that time, Envirocare has not resubmitted a revised license application. In a letter dated May 14, 1998, staff informed Envirocare that it had consulted with the Commission regarding the petition and that the Commission had directed staff to focus its limited resources on review of the license application. Therefore, staff has not taken any further action on the petition. In a letter dated August 21, 1998, Envirocare stated that it did not intend to submit a revised license application at this time, and has decided to pursue the rulemaking petition.

In May 1997, the State of Utah determined that Envirocare had exceeded the SNM possession limits in its State of Utah license. Consequently, NRC Region IV conducted an inspection of the facility in June 1997. The findings of the inspection are discussed in an inspection report and demand for information dated May 21, 1998. As a result of the inspection, NRC issued a Confirmatory Order (Order) on June 25, 1997, which required Envirocare in part to reduce its possession of SNM and to submit a compliance plan (CP) to NRC for approval. As part of the approved CP, trucks containing SNM waste can proceed to the disposal cell (assuming the conditions stated in the Order apply) without counting the SNM waste in Envirocare's possession inventory. This waste is considered "in-transit," under the exemption of [10 CFR 70.12](#), because the carrier is still present.

In a letter dated October 14, 1997, the State of Utah informed NRC that SNM waste was being transferred from rail cars to trucks in the Salt Lake City rail yard and then taken to the Envirocare site either directly or after storage in transit at a transport facility. To evaluate this practice, NRC and Department of Transportation (DOT) inspectors conducted an inspection. The inspection concluded that, in general, applicable NRC and DOT regulations were being followed. (The inspection is documented in a report dated April 21, 1998.) However, in a memorandum dated June 26, 1998, the NRC Region IV Administrator noted concerns from an NRC staff member that the loading and unloading of waste in Salt Lake City may pose a safety problem, and requested that Office of Nuclear Material Safety and Safeguards staff review this issue.

Before the Order and CP, rail shipments were transported directly to a rail siding adjacent to the site. Rail cars were staged on the siding until the waste could be moved onto the site within licensed limits. Subsequent to the Order and CP which, as noted, provide for trucks to proceed directly to the disposal cell without being counted in the SNM possession inventory, it has been operationally advantageous for Envirocare to receive SNM waste via truck. In addition, transfer from rail to truck in Salt Lake City is more economical for the shippers because rolling stock rental fees are reduced. Thus, the Order and CP may have led to a practice of transferring of SNM waste from rail cars to trucks in Salt Lake City. Some trucks are staged at a nearby industrial facility and do not go directly to the disposal site because of the SNM possession limit. Staff concludes that this process has resulted in a change in the mode of transportation of waste to the site (i.e., more truck shipments), leading to a slightly higher probability of a transportation accident. Moreover, the increased waste handling has increased the possibility of container rupture and resultant spillage in a metropolitan area. Thus, the current practice -- while conforming to applicable NRC and DOT regulations -- might be regarded as less safe and may be a direct result of conditions in the CP.

## DISCUSSION:

To resolve this issue, staff explored ways in which rail cars could be allowed to proceed directly to the site. Staff considers that if the SNM waste was shipped in accordance with [10 CFR Part 71](#) and applicable DOT regulations that these conditions were sufficiently protective while the waste was on the rail cars, regardless of being located inside or outside the site boundary. Staff further evaluated whether the State of Utah license concentration limits would be acceptable to prevent an inadvertent criticality for waste in the disposal cell. This evaluation is included as an [Attachment](#). Based on its

evaluation, staff concluded that the State license concentration limits are sufficiently conservative to prevent inadvertent criticality. Considering that the disposal of SNM at the Utah license concentration limits at Envirocare has been evaluated and found to be safe, an acceptable rationale, therefore, exists for allowing above ground storage of similar material in a comparable or more dispersed configuration. This rationale, in the staff's view, supports NRC taking action to alleviate the regulatory constraint that appears to have led to the less than optimal practice, described above, for transporting SNM waste to Envirocare. To resolve these issues and to avoid unnecessary regulatory burden, staff proposes to issue a Confirmatory Order to Envirocare, under Section 274f of the AEA, which would exempt the receipt, possession, storage, handling, and disposal by Envirocare from NRC licensing requirements for diffuse low-level waste at the current State license concentration limits. The staff would issue the Order in conjunction with necessary revisions to Utah's Agreement State regulatory program, as discussed below, to require State licensing of the SNM waste that would be covered by the exemption from NRC licensing requirements. Under Section 274f of the AEA, the Commission is authorized, by regulation or order, to grant exemptions from licensing requirements, and from its regulations applicable to licensees, as the Commission finds necessary or appropriate, to carry out an agreement with an Agreement State. This approach is essentially the same as discussed in the staff's November 13, 1995, memorandum to the Commission on this topic.

Treatment or processing of mixed waste containing SNM poses safety concerns associated with potential reconcentration during treatment and, therefore, safety cannot be assured based solely on a concentration limit. If approved by the Commission, staff would develop appropriate conditions for the Order to delineate the exempted and non-exempted activities at the site which would define new criticality safe concentration limits. Restrictive conditions for these exempted activities would include conditions that assure the concentration and homogeneity of the SNM in waste, limit plutonium-241 to 12 percent of the plutonium-239 content, and limit SNM being processed to a batch limit of 350 grams of uranium-235 (U-235) or 200 grams of plutonium. For mixtures of U-235 and plutonium, the sum-of-the-fractions rule would apply.

To implement the provisions of the Order, the State of Utah will need to take certain actions that are consistent with NRC's proposed Order. Utah would likely need to revise its existing regulations (or develop alternative legally-binding requirements) that Envirocare must meet to ensure safety in its receipt, possession (storage), and emplacement of low-level waste, to ensure the regulations cover diffuse waste up to the newly defined criticality safe concentrations limits. Any alternative legally-binding requirements may have to be implemented through appropriate conditions added to the Envirocare license, or through an order. The staff will work with the State to ensure any changes to State regulations are consistent with NRC's proposed order. Based on preliminary conversations with the Director, Division of Radiation Control, the Utah program agreed with this approach. Under this approach, the Utah Agreement would not need to be amended. Staff notes that, with the newly defined "criticality safe" concentration limits, there would be no limit on the number of grams of U-235 and plutonium that Envirocare could possess under a Utah State license. The Utah Agreement discontinues NRC authority only for "special nuclear material in quantities not sufficient to form a critical mass". The level of criticality safety that would be realized through the newly defined criticality safe concentration limits for U-235 and plutonium would address the same criticality safety concerns that were the basis for reserving to NRC regulatory jurisdiction over SNM in excess of certain mass limits i.e., the limits set out in [10 CFR 150.11](#)). The criticality safe concentration limit, therefore, reasonably assures that any number of grams of U-235 and plutonium, in concentrations less than such limit, will not be sufficient to form a critical mass. At the time Part 150 was developed, the Commission likely did not envision that large quantities of diffuse waste containing low concentrations of SNM would be generated. Thus, mass limits that are in Part 150 have little relevance to large quantities of diffuse waste containing low U-235 concentrations, other than providing absolute assurance of criticality safety by preventing accumulation of a critical mass.

Staff notes that this proposed exemption action may have certain precedent-setting implications. If any other low-level waste disposal facility licensee requested a similar exemption, staff would evaluate the criticality concerns on a site-specific basis and inform the Commission of the staff's conclusions regarding the exemption.

To expedite the process, the staff plans to proceed with developing the basis and conditions for the exemption, pending Commission approval with the approach. Staff will hold discussions with the State of Utah and Envirocare regarding the scope of the exemption. Staff then plans to complete and issue the exemption order, but the exemption would not go into effect, or be implemented, until Utah completes complementary State actions that are necessary for implementation of the exemption. Alternately, staff could delay the order and wait for the State of Utah to complete revisions to its regulations and/or Envirocare State license, but does not plan to delay the order unless directed by the Commission to do so.

In accordance with existing Commission guidance, staff is proceeding with developing emplacement criticality guidance and evaluating the compatibility of [10 CFR Part 61.16\(b\)2](#). The guidance document would further evaluate the disposal criticality safety at Envirocare, and other operating and future disposal sites. It is anticipated that the guidance will be published in the fall of 1999. After the guidance is developed, staff intends to reevaluate the conditions set forth in the order and revise the order as appropriate. Staff will also consider, at that time, possible rulemaking options to adopt a generic exemption for criticality safe concentrations of SNM in Part 150.

#### RECOMMENDATIONS:

That the Commission approve the staff plans to develop a confirmatory order to Envirocare, as described above, and work with the State of Utah to revise Utah regulations (or develop alternative legally-binding requirements) and the Envirocare license, as required, to be consistent with the order. In addition, the order would be published as a notice in the *Federal Register*.

Staff requests action within 10 days. Action will not be taken until the SRM is received. We consider this action to be within the delegated authority of the Executive Director for Operations.

#### COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections.

L. Joseph Callan

**SAFE SOIL CONCENTRATION LIMITS  
AT ENVIROCARE OF UTAH, INC.**

Under the license issued by the State of Utah, Envirocare of Utah, Inc. (Envirocare) is currently allowed to dispose of waste with a maximum average concentration of 770 pico Curie per gram of waste (pCi/g) for uranium-235 (U-235); 1000 pCi/g for plutonium-239 (Pu-239); and 3500 pCi/g for Pu-241. The State license does not permit disposal of U-233.

Previously, staff had examined the development of a generic safe soil concentration limit for U-235 and Pu-239. Assuming homogeneity, staff calculated a critical concentration of 2,000 pCi/g for U-235 and 26 micro Curie per gram of waste (mCi/g) for Pu-239. To account for uncertainties, staff applied a factor of safety of 5, and recommended a safe soil concentration of 400 pCi/g for U-235 and 5 mCi/g for Pu-239. During staff's evaluation of the Envirocare petition, staff concluded that potential technical issues, such as the possible reconcentration of SNM during processing, or factors relating to homogeneity, enrichment or super moderators, needed to be resolved before it had a sufficient technical basis to establish such a generic limit.

NUREG/CR-6505, Vol. 1, "The Potential for Criticality Following Disposal of Uranium at Low-Level Waste Facilities - Uranium Blended in Soil," (Envirocare study), evaluated the possibility of U-235 to migrate from its disposal configuration and reconcentrate in a critical configuration. The Envirocare study examined, in part, the criticality potential of homogeneous mixtures of 100 percent enriched uranium and silicon dioxide at various concentrations and moisture contents. The Envirocare study shows that homogeneous SNM waste in a dry state at the maximum allowable average U-235 concentration (770 pCi/g) is subcritical. Any addition of water as a moderator further reduces the criticality risk of the system. The study indicates that a concentration three times larger than the 770 pCi/g would be required to pose a criticality concern at 100 percent enrichment.

With the exception of a limited number of waste streams (e.g., Nuclear Fuel Services, Babcock & Wilcox - Lynchburg, Rocky Flats, etc.), the typical enrichment of fuel cycle waste containing SNM is less than 5 percent. Based on yearly disposal records for the past four years, the average uranium enrichment ranged from 0.3 to 1.8 percent. Thus, Envirocare is not receiving significant quantities of high enriched waste, which further reduces the risk of an inadvertent criticality.

To evaluate the appropriateness of the license concentration limits for plutonium, staff used NUREG-6284, "Criticality Safety Criteria for License Review of Low-Level Waste Facilities." Using site characteristics (depth of disposal and unit weight of the waste), staff calculated a safe soil concentration of 1.7 mCi/g for Pu-239. This guidance document did not evaluate an areal density for pure Pu-241, the other fissile isotope of plutonium, but rather evaluated Pu-239 with a 12 percent mixture of Pu-240 and Pu-241. Based on this mixture, a safe soil concentration of 453 mCi/g was estimated for Pu-241. These values are considered conservative because the concentrations evaluated in the NUREG are much higher than those allowed by the Utah license. Because the Utah license concentration limits are significantly less than the concentration values calculated by the staff, staff finds the license limits acceptable to prevent an inadvertent criticality.

All the aforementioned calculations assume homogeneous mixtures of SNM. As noted above, staff was concerned that this assumption, in a generic sense, may not be appropriate, particularly for diffuse SNM in waste. However, through the inclusion of conditions relevant to the particular issues at Envirocare and with its knowledge of site activities, staff has concluded that establishing a site-specific limit for Envirocare to dispose of waste with average SNM concentrations of 770 pCi/g for U-235; 1000 pCi/g for Pu-239; and 3500 pCi/g for Pu-241 will be protective of public health, safety, and the environment. These conditions would include conditions that assure the concentration and homogeneity of the SNM in waste, and limit Pu-241 to 12 percent of the Pu-239 content.